Ventura County

Watershed Protection District

Groundwater Section

Guidelines for preparing a Manure Management Plan (MMP)

If a land development application involves animal husbandry or animal boarding facilities that are not typically associated with a farm or ranching operation where livestock is raised specifically for resale or to create animal derived products for resale (such as milk, eggs, etc.), additional assurances concerning water quality impacts may be required. If water quality is a matter of concern, an applicant may be asked to prepare a Manure Management Plan (MMP) for all animal waste that could potentially be generated and submit the plan for approval to the County Watershed Protection District. The Manure Management Plan is required to properly assess the long-term potential project and cumulative impacts to the area groundwater quality. The MMP shall contain the following items:

Applicant shall provide the following information, or contract with a professional consultant to determine the nitrate impact on groundwater from proposed or existing livestock at the project site. Consultant shall complete and submit a report to the Division providing comprehensive findings and recommendations, if any, to mitigate impacts to safe drinking water to less than the State standard of 45 mg/l for nitrate.

If composting and/or de-nitrification are associated with the animal operations, applicant shall provide construction plans for manure holding or storage areas. Such areas shall be underlain by an impermeable surface that will prevent waste from percolating into the groundwater, or sufficient evidence must be presented to show why groundwater supplies will not be impacted. If needed, the impervious flooring or surface shall be underlain by an impervious high-density polyethylene (HDPE) plastic liner, although alternate forms of protection may be submitted to the Division for review and approval.

When outdoor manure storage or exposure is a factor, the applicant should also include a plan or means for preventing percolation of leachate into the groundwater aquifers. Provisions should be made in the plan for mitigating this action (unwanted percolation) which may include a plan for capturing surface runoff within the site and preventing percolation of leachate outside of the project or offsite.

Key items or factors that should be included in any MMP must be:

1 The number of animals currently on the property, the average number present at any given time, and the maximum number allowed by permit and/or the County's Zoning Ordinance.

2. The frequency of manure cleanup (the number of times per week or month the stalls, corrals, barns, cages, etc. are picked up or cleaned).

3. The location, frequency, and means of handling manure, such as:
   A. Stored in a large truck-type roll-off bin or dumpster.
   B. How manure is piled in a designated portion of the lot for later spreading or removal. (manure holding area shall be underlain by an impermeable surface that will prevent waste from percolating into groundwater)
   C. Removal to an approved Class II or better landfill on a daily or weekly basis.

4. Provide a plot plan showing all aspects of the manure handling activities including:
   A. All manure storage pile or bin locations (temporary or permanent). (NOTE: storage piles must be underlain by an impermeable surface as in 3.A. above)

B. All animal housing, enclosure, and roaming areas where manure might build up.
C. Surface runoff patterns on the property or parcel where animals are located and a plan for capturing surface runoff on the site and preventing percolation of leachate outside of the project.

5. Who handles the manure on a regular basis (i.e., is it contracted out to a qualified waste hauler or handled by property owners or employees)?

6. Who picks up and/or transports the manure (qualified waste hauler or land owner/employees)?

7. What type of equipment is used for spreading the manure if such a method is utilized (describe spreader make and size, rate of spreading used, etc.)?

8. Where are these spreading areas located (onsite or on adjacent properties)?

9. How often is the spreading of the manure performed (list schedule or time interval of cleanups and manure distribution, and how it is spread or mixed with soils or amendments if that method is employed)? Manure may not be spread upon land where there is no obvious use. Spreading should be done with the intent that manure serves as fertilizer for forage crops, as agricultural soil enhancement, or serves similar beneficial means. Manure application rates shall not exceed the per-acre tonnage as listed in Table 2 of the referenced Colorado State University Horse Manure Management Report.

10. Are there any chemicals or additives added to the manure to control odors, flies, etc. or that would speed up the breakdown or attenuation of the manure?

11. What is the average rainfall in the project location?

12. What type of soil (clay, sand, silt, rock) underlies the site?

13. What are the potential impacts to groundwater quality? (discuss all possible negative or positive impacts to the soil profile and/or groundwater supplies if applicable). Manure spreading application rates shall not exceed soil salinity limits as listed in tons per-acre under Table 3 of the referenced Colorado State University Horse Manure Management Report.

14. What type of flooring is installed in the animal housing areas (barns, covered stalls, raised cages over a concrete slab or dirt flooring, etc.)?

15. What type of quality control is in place for the manure management plan conditions or operation procedures (i.e., is there a backup plan if something breaks down in the normal process, and/or are periodic checks or training done on or for the people effecting the cleanup and handling?

16. What is the final disposition of the manure after handling, collection, storage, and transport?
    A. Is it bagged for sale?
    B. Is it sent to a sanitary landfill?
    C. Is it attenuated into the soils if spread, and what means are used to show this?

17. Are there separate permits needed for this manure handling process? If so, who issues such permits and what is the time or duration of the permit?

18. If needed, what are the permit requirements regarding animal volume, manure management, and vector/odor controls?

19. A copy of any contract, permit, or agreement with a neighbor to dump on adjacent parcels, etc. should be provided as evidence of processes described in the MMP or to prove statements therein.

Attachment: Colorado State University – Horse Manure Management; no. 1.219

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Colorado State University Extension - Agriculture

No. 1.219

Horse Manure Management

by J.G. Davis and A.M. Swinker1

Quick Facts...

- An average 1,000-pound horse produces 9 tons of manure a year containing valuable fertilizer elements.
- Horse owners have a responsibility to manage the manure that is a byproduct of their industry.
- Manure is commonly stockpiled prior to use. Adequate storage area allows for greater flexibility in timing of manure use.
- Recordkeeping is an essential factor in. land application of manure/compost.
- The total fertilizer value of the manure produced by Colorado's horses is estimated to be $10 million per year.

An average 1,000-pound horse produceS 9 tons of manure a year (50 pounds per day) containing valuable fertilizer elements. (See Table 1.) Add to that an additional cubic foot of bedding material and you get 730 cubic feet/year from one horse. How the manure is stored and treated has a substafltial impact on its value. The labor,storage and utilization costs for manure management can be considerable.

Colorado's horse industry uses two principal feed management systems, according to a recent survey. The first system permits horses to graze full-time on pastures, and the manure is not collected or treated. Pasture manure usually is spread by harrow cultivation that promotes decomposition. .

The second system confines animal feeding, which relies on intensive management, and the horses are kept in stalls or runs. The horses may be housed in box stalls and proVided a bedding source for urine absorption. Alternatively, horses are kept in corrals or runs, and some runs are attached to stalls. Manure is managed in one or more of the following ways: 1) compost (Il'lanure is removed daily and composted); 2) stockpile (manure is removed daily and stored in piles); and, 3) daily land application (manure is removed daily and spread on cropland).

Marketing Plan

Horse owners have a responsibility to manage the manure that is a by-product of their industry. Develop a management plan for manure and soiled bedding. Use it on crop lands, arena surfaces, trail surfaces, and landscaping. If you don't plan to use the manure yourself, develop a marketing plan so others can make use of it.

Contract or donate compost to crop farmers and community landscapers or parks, and neighborhood gardeners. Offer a discount to boarders if they dispose of manure. The people who come to watch others ride are another potential market for manure or compost sales. Before you can market the product, it must be completely and properly composted and free of foreign material such as pop cans, wire, and syringes.

Make an arrangement or contract with a landscaper, nursery or crop farmer. Be prepared to handle your own by-product. One option may be to deliver manure, at your cost, to a site where contractors do the composting. Pre-determine the bedding types they prefer in their compost mix.

Manure Collection

Confinement Housing (Stalls, Drylots, and Runs). Daily maintenance of horses in a confinement setting requires intensive labor. Horses housed in stalls and sheds require soft absorbent bedding. The most common bedding sources in Colorado are pine sawdust (80 percent), pine wood chips (17 percent), and straw (2 percent). Some other sources are shredded newsprint, peanut shells, peat moss, rice hulls, etc. Remove manure and soiled bedding on a regular basis and handle appropriately to prevent fly infestation and disease transmission.

Pastures. Manure management in pastures depends primarily on getting good distribution of manure across the pasture.To avoid manure concentration in isolated spots in a pasture, distribute grazing evenly. Rotational grazing is one of the best ways to achieve this goal; however, horse owners don't usually have large enough pastures for rotational grazing.

On the other hand, pastures can be split, and the horses moved back and forth between both parts of the pasture to distribute the manure more uniformly. Availability of several watering facilities and moving feeding facilities periodically will encourage better manure distribution.

Avoid grazing during rainy periods when soils are saturated, to avoid soil compaction and manure runoff. Restrict access to streams to avoid manure deposition in or near water bodies. This can be done by fencing or providing shade away from the streams. Refrain from excessive stocking rates that lead to overgrazing. Damaging the grass stand increases manure runoff potential from pastures.

Storage and Treatment

Stockpiling. Manure is commonly stockpiled prior to use. Adequate storage area allows for greater flexibility in timing of manure use. Therefore, be sure you have a large enough storage area to accommodate the manure produced. Over time, the manure shrinks from decomposition and moisture loss.

Proper site selection for the storage area is important to safeguard against surface and groundwater contamination. Place stockpiles at least 150 feet away from surface water (creeks and ponds) and wells. Establish and maintain grass buffer strips between water bodies and manure piles. Construct a perimeter ditch or berm around the storage area, if needed, to prevent runoff onto or off of the area.

Composting produces a relatively dry end-product that is easily handled and reduces the volume of the manure (40 percent to 65 percent less volume and weight than the raw manure). Composting at proper temperatures can kill fly eggs and larvae, pathogens and weed seeds. Compost has less of an odor compared to raw manure and is more easily marketed. Composted manure acts as a slow release fertilizer and an excellent soil conditioner.

To be done right, composting requires an investment of time and money. Machinery required includes a tractor, a manure spreader and a front-end loader. Some ammonia-nitrogen is lost during the composting process, and an ammonia odor may result for a short period. When composting is done on a large scale, additional land and machinery requirements exist.

Microbes that drive the composting process require optimum conditions of temperature, moisture, oxygen, and carbon:nitrogen (C:N) ratio. The C:N ratio should be between 25:1 and 30:1; horse manure has an estimated C:N ratio of 50:1. With the addition of bedding material (high carbon content), the C:N ratio will be even higher. Therefore, N has to be added to the manure for it to compost properly. The addition of grass clippings, hay, or fertilizer [25 to 30 pounds N/ton of manure (75 to 90 pounds of ammonium nitrate or 50 to 65 pounds of urea)] should bring the C:N ratio into the optimum range. When microbes work properly, the compost temperature will be between 120 and 160 F. Cooler temperatures result from a lack of N. When the composting process is complete, the temperature will cool naturally.

It is important to have the right balance of moisture and air for the microbes to process the manure. The compost should be moist but not soggy, and may need to be watered or covered with plastic to maintain moisture. Aerate the compost by turning it regularly. The manure and bedding particles should be about one-half inch to one and a half inches in size. Composting does require effort, but the result is a more easily used and economically valuable fertilizer.

Utilization

Land Application. Recordkeeping is an essential factor in land application of manure/compost. It is critical to know how much manure/compost was applied to each field and when it was applied. Analyze manure/compost regularly and record the lab results for future reference. Note changes in nutrient value and factor them in when calculating future application rates.

Manual loading and land application are labor intensive and impractical for managing the manure generated by more than 25 horses. Consider mechanical loading and application with a bobcat or tractor-operated loader when the manure or the land application becomes large.

Apply the manure/compost uniformly to achieve an acceptable application rate. The finer textured and more uniform the manure, the easier it is to apply uniformly. Spreaders apply manure/compost at different rates depending on ground speed, PTO speed, gear box settings, discharge openings, and manure moisture and consistency.

Do not apply manure to land that is highly erodible, frozen or saturated. To protect water sources from manure runoff, do not spread manure within at least 150 feet of a water source (such as a well, creek or pond). Incorporate manure into the soil as soon as possible. Mixing the manure with the soil immediately reduces losses of manure nutrients to runoff and volatilization, and reduces odor problems associated with manure left on the soil surface.

Base the manure/compost application rate on crop N needs and available soil and manure N levels. Test your soil and manure for N levels at a certified laboratory. In general, the higher a crop yield goal, the greater the N requirements. Irrigated crops also tend to need more N. If yield goals are. lower than those shown in Table 2, decrease the manure application rate and increase the land application area. If yields are higher, less land is needed. Soils high in organic matter and nitrate have higher available N in the soil and require less N.

Table 1: Average fertilizer content in horse manure (as-is basis).

Table 2: Average manure application rates and land base (area) requirements for forages.

Landfill. Manure and compost are sometimes landfilled, dumped in gullies and used to repair roads. These are not recommended practices due to high runoff and leaching potential from gullies and roadways. If the areas are not vegetated and are waterways for storm runoff, the potential for runoff of manure nutrients into creeks and ponds is high. When excessive nutrients exist in surface waters, plant and algal growth becomes extreme, the oxygen supply is depleted, and fish can be killed.

Footing for Riding Arenas. An ideal arena surface provides resilient footing for optimum horse performance. Drain the arena well, maintain adequate depth to protect horses' legs from contusions, and keep the arena absorbent to hold moisture efficiently and prevent dust. The arena surface also must be odor-free. Composted manure/bedding makes an ideal surface addition when mixed with river sand and wood products. Uncomposted manure and bedding results in ammonia fumes that can cause respiratory problems in horses. Surface depth of compost depends on soil type and climate; too much organic matter can hold excess moisture and may cause the horses to slip and fall.

Table 3: Maxium manure application rates to avoid soil salinity problems.

Precautions

Virtually no viral diseases are transmitted between horses and humans through fecal material, but some bacteria and protozoans (such as E. coli and Giardia) can be transmitted in this manner. Therefore, handle manure carefully to prevent disease transmission. In addition, horse manure runoff into waterways may produce fecal coliform contamination levels that can be potentially hazardous to fish and anyone who drinks that water.

Runoff. Runoff water from dry lots, pastures, and manure storage or compost areas carries pollutants (such as nitrogen, phosphorus, and bacteria) into surface waters. Avoid overirrigation of pastures. Build berms or trenches to prevent water from entering or leaving dry lots and man.ure storage and composting areas. Do not allow a creek or irrigation canal to pass through drylots.

Parasite Prevention and Control. Horses pick up parasites by ingesting grass, feed, or water that is contaminated with parasite larvae and eggs. The most common internal parasites of horses are the ascarids, strongyles (large and small), pinworms and bots.

Insect Control. Excellent fly-breeding conditions occur in mixtures of manure, spilled feed and decaying bedding. To help eliminate these areas, remove and spread the manure regularly and prevent accumulation of other wastes. Composting at proper temperatures inhibits fly development. Several pesticides can be used on manure piles to kill maggots. Cover manure stockpiles or compost sites to exclude flies and prevent their development.

Noncomposted manure piles can provide an ideal environment for the bumble flower beetle white grub. White grubs feed on decaying manure; however, these grubs do not damage home lawns. Therefore, there is no need to control them.

Mosquitoes require standing water to reproduce; therefore, it is imperative to prevent ponding of water in manure storage areas.

Salinity. Manure tends to be high in salts, which when land applied at excessive rates, contribute to soil salinity. Soil salinity causes plants to become water stressed or, in extreme cases, die. When manure is not soil-incorporated, as in applications to pasture, the salts accumulate on the soil surface unless they are leached into the subsoil. Irrigation or rainfall may move salts out of the topsoil and move them into deeper depths

of the soil profile. If salinity levels in the soil and manure are known, use Table 3 to determine acceptable maximum rates of manure application for most forages to avoid excessive soil salinity (>4 mmhos/cm).

Weeds. A weed is an unwanted, out-of-place plant. Weeds compete with crops for limited resources of water, nutrients and light. Manure has contributed to weed problems where it has been applied to cropland. Use composted manure to avoid these problems. When manure is composted, the high temperatures achieved during the composting process kill most weed seeds. Some weed infestations may be the result of overgrazing, not due to manure applications.

Parasite Preventions and Controls

Deworm all horses on a regular schedule using an anthelmintic. Contact a veterinarian for anthelmintic recommendations.

Manure management:
A. Remove all manure from stalls, small corrals, and paddocks on a daily basis.
B. Compost all manure to a temperature of 145 F for at least two weeks to kill most parasite eggs, or compost at lower temperatures for longer periods of time.
C. Spread manure on pastures only after composting.
D. Manure that has not been composted should be spread only on crop land or other ungrazed, vegetated areas.

Pasture management:
A. Mow two to four times a year and chain harrow (drag) to break up manure piles and expose parasite eggs to the elements.
B. Don't overstock.
C. Practice rotational grazing if possible.
D. Graze young horses separately from older horses; the younger horses have a higher susceptibility to parasites.
E. Follow horses with cattle or sheep before returning a pasture to horses. This interrupts the life cycles of horse parasites.
F. Deep harrow or plow pastures that are badly parasite-infested. Deep plow pastures and reseed every three to five years. This also helps break parasite cycles.

Feed and water management:
A. Use feeders, racks, bunks or mangers for feeding hay and grain. This will prevent feed from getting mixed with feces. Don't feed off the ground.
B. Provide horses a clean, fresh drinking water supply.
C. Avoid water contaminated with feces.

Resources

Spencer, W., and D. Tepfer. 1993. 3.762, Economics of composting feedlot manure. Colorado State University Extension.

Wilson, C.R., and J.R. Feucht. 1991. 7.212, Composting yard waste. Colorado State University Extension.

Waskom and Davis. 1999. BMPs for Manure Management, Colorado State University bulletin no. 568a.

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